

REMARKS

In view of the above amendments and following remarks, reconsideration of the rejections contained in the Office Action of October 19, 2004 is respectfully requested.

Initially, it is noted that the status of the parent application as U.S. Patent 6,667,238 has been updated on page 1 of the specification.

In addition, a number of minor changes, for the sake of grammar and readability, have been made to the specification.

In section 3 on page 2 of the Office Action, the Examiner rejected claim 6 as being anticipated by Miyashita et al., U.S. Patent 6,167,583 (Miyashita). Further, in section 5 beginning on page 3 of the Office Action claims 1, 2, 4, 5, 7 and 8 were rejected as being unpatentable over Miyashita in view of Hayashi et al., U.S. Patent 6,379,230 (Hayashi). Lastly, claim 3 was rejected as being unpatentable over Miyashita in view of Hayashi in further view of Sakurai et al., U.S. Patent 6,082,373 (Sakurai). However, it is respectfully submitted that the present invention, at least as now reflected by the above amended claims, clearly patentably distinguishes over each of Miyashita, Hayashi and Sakurai.

The present invention relates to a polishing apparatus for polishing a substrate surface having a semiconductor device thereon. In such devices, wiring grooves may be filled by copper plating at a high aspect ratio. After a copper layer is polished in a CMP process, the polished surface has high activity, so that the polished surface is liable to be oxidized. If the polished surface on the semiconductor wafer is left as it is, an oxide film is formed by natural oxidation of the surface of the wafer. Such natural oxide film formation, however, tends to form the film irregularly or non-uniformly, because there is no control of the formation. Thus the film is of poor quality. This can change the electrical characteristics of the products that are produced.

In accordance with the present invention, a cleaning section of the polishing apparatus cleans a substrate that has been polished. The cleaning section includes an electrolyzed water supply device (for example 25a or 25b in Fig. 4) for supplying electrolyzed water to the substrate so as to clean at least the polished surface of the substrate while supplying the electrolyzed water to the substrate. As discussed in section 36 of the specification, on pages 9 and 10 thereof, an ultrasonic transducer 26

may be employed to produce megasonic anode electrolyzed water. Further, it is desirable to install a measuring device and/or a controller for monitoring and/or controlling characteristic value such as pH or ion concentration in an electrolyzed water generator that is used to generate the electrolyzed water.

The purpose of supplying the electrolyzed water to the surface of the substrate in the cleaning section is to form metal-oxide film on the surface of the substrate. By supplying the electrolyzed water in this manner and at a desired place in time in the polishing apparatus and process, the substrate having the uniform and good oxide film and quality can be obtained.

Each of independent claims 1, 6, 7 and 8 has been amended to recite that the apparatus further comprises the measuring device for monitoring pH or ion concentration of the electrolyzed water supplied by the electrolyzed water supply device to the substrate.

Further, each of new dependent claims 9, 11, 13 and 15 further recite the electrolyzed water generator for generating the electrolyzed water.

Further, each of new dependent claims 10, 12, 14 and 16 recite a controller for controlling the pH or ion concentration of the electrolyzed water in the electrolyzed water generator.

In the cited patent to Miyashita, a processing liquid supply unit 29 can supply ionized water 18. The water 18 is generated by an ionized water generator illustrated in Fig. 8. Note the discussion in column 4 of Miyashita. As discussed in column 4, this ionized water is used to perform polishing. As discussed in column 5, however, it can also be provided to the double sided cleaning apparatus of Fig. 1. As discussed at line 21-24, dust attaching to the surface of the semiconductor wafer 1 can be removed.

However, Miyashita neither discloses nor suggests a measuring device for monitoring pH or ion concentration of the electrolyzed water supplied by the electrolyzed water supply device of the cleaning section. It is noted that there appears to be no discussion or concern with being able to appropriately form a metal-oxide film on the surface of the substrate in Miyashita. There is, accordingly, no basis for any suggestion to one of ordinary skill in the art to provide such a measuring device for monitoring pH or ion concentration of the electrolyzed water with the apparatus of Miyashita.

Miyashita, further, clearly fails to disclose or suggest the recited controller for controlling the pH or ion concentration as recited in each of claims 10, 12, 14 and 16.

Hayashi was cited for the proposition of disclosing a top ring for holding a substrate and at least two polishing surfaces for conducting several polishing steps on the polishing surface. However, Hayashi also fails to disclose or suggest a measuring device for monitoring pH or ion concentration of the electrolyzed water. The same is true of Sakurai, which was cited for the proposition of applying ultrasonic vibrations.

Accordingly, it is respectfully submitted to be clear that all of claims 1-16 now pending in the present application distinguish over each of Miyashita, Hayashi and Sakurai. Indication of such is respectfully requested.


It is believed that the above clearly places the present application into condition for allowance. It is noted that a number of specific positions taken by the Examiner have not been specifically addressed in this response. This should not be taken as acquiescence to such positions, and Applicants reserve all rights to traverse such positions as appropriate.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact Applicants' undersigned representative.

Respectfully submitted,

Norio KIMURA et al.

By:



Nils E. Pedersen
Registration No. 33,145
Attorney for Applicants

NEP/krq
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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